ADVANCED SCIENCE AND TECHNOLOGY INSTITUTE

1992 Annual Report

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For its pioneering success, innovation and productivity in advanced research and development, ASTI was recognized as one of the best R&D agencies in the country in 1992.

ASTI Organizational Structure

FINANCE AND ADMINISTRATIVE DIVISION

Provides the Institute with general administration and support services for personnel welfare, property and supply management and other financial management.

INFORMATION TECHNOLOGY DIVISION

Conducts R&D activities for the advancement of computer and communication technologies in the country.
Engages in computer hardware and software engineering, as well as radio, telephone and digital communications engineering.

OFFICE OF THE DIRECTOR

Plans, programs, oversees, coordinates, reviews and evaluates all the activities of the institute.

MICROELECTRONICS DIVISION

Undertakes advanced research and development in the field of electronics.
Seeks to modernize local industries through the applications of electronic instrumentation and control, and through indigenious design of microelectronics.

BIOENGINEERING DIVISION

Complements the endeavor of the advanced engineering fields of bio-engineering.
Fabricates prototype instruments and devices needed for applications of and further research of medical, agricultural and environmental science.

SPECIAL AREAS DIVISION

Supplements advanced R&D activities in the fields not covered by the other R&D divisions.
Designs, fabricates and prototypes instruments for advanced researches in energy , volcanology and seismology.
Shall be in charge of packaging technologies and products developed by the other divisions.

Executive Summary

1992 was indeed a recognition year for ASTI. The Institute bagged the coveted Institutional Award during the year's National Science and Technology Week in recognition for its pioneering role in using innovative procedures and advanced technologies in its R&D programs. This only shows that the Institute has already gained the confidence of government and the local electronics sector for its expertise in IT, computer software and electronic hardware designs.

For the fourth consecutive year since its first operations in November 1988, ASTI has remained the government agency with the youngest average age of its employees. In fact, the assumption of Louis Casambre as Officer-In-Charge of the Office of the Director made him at 30 year old, the youngest member of the DOST Management Committee composed of agency heads.

Significant strides have been achieved in ASTI's implementing strategies and R&D thrusts. Institutional infrastructures such as policies, manpower and facilities were strengthened to improve its delivery of new products and technologies. These were undertaken to transform the Institute into a world-class R&D facility responsive to the country's needs for development, one of which is, the establishment of a self-sufficient local electronics sector.

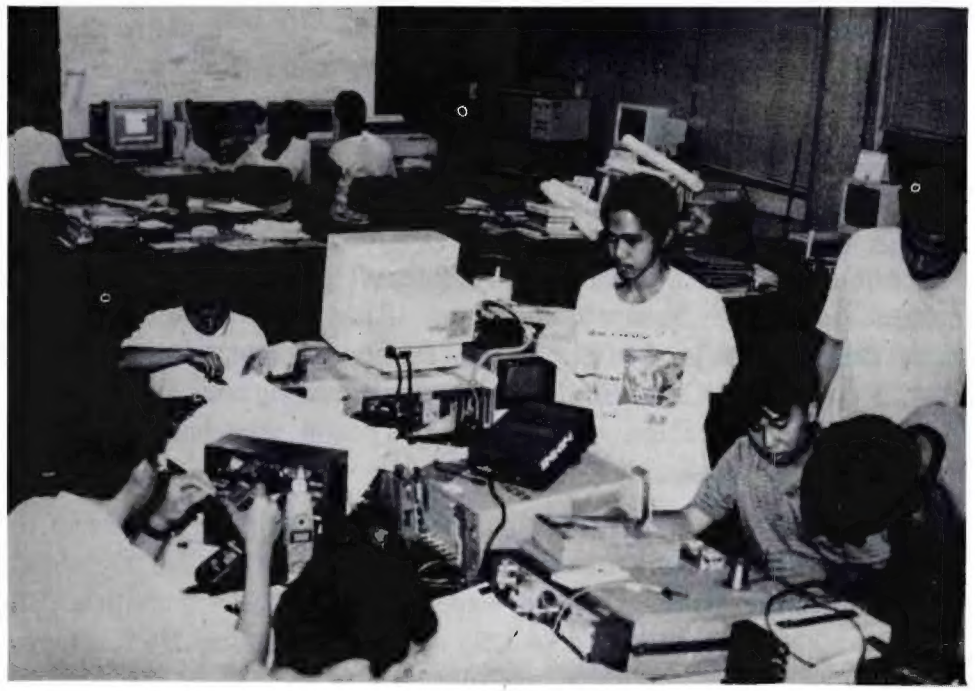
Highlights of 1992

R&D ACCOMPLISHMENTS

In 1992, ASTI had been most successful, among its R&D thrusts, in the fields of office/industrial automation and software development.

A numerically controlled drill for PCB manufacture has just been completed. It is expected not only to enhance ASTI's prototyping capability for all its R&D efforts that involve printed circuit boards but also to help the industrialization of the economy through the design and adoption of NC machines in the domestic electronics sector. With the current global trend of miniaturization of electronic products, investments on automation might one day prove a prudent decision.

Meanwhile, a voice and word recognizer was also developed paving more intensive use of Digital Signal Processing (DSP) and Neural Networks technologies to the Institute's software development efforts. Intensive use of these state-of-the-art computer software techniques in the domestic software industry will result in quality world-standard outputs.



ASTI specializes in advanced R&D in microelectronics, telecommunications, information technology and software development using computer-aided engineering and other tools.

TECHNOLOGY TRANSFER

On technology delivery, the Institute exerted all efforts to transfer to potential industry users the final prototypes that were developed. ASTI chose to concentrate in the transfer of technologies that offer high added value, namely: the Private Automatic Branch Exchange (PABX), the Packet Radio Terminal Node Controller (TNC), a Spectrum Analyzer and an Electrocardiograph (ECG).

Success in the technology transfer endeavor, however, came first with the Automatic Checker (using Neural Networks) developed for the University of the Philippines College Admission Test (UPCAT).

As for the rest, the Technology Application and Promotion Institute (DOST-TAPI) started conducting both market feasibility and prefeasibility studies to determine their business viability. The results of the studeies are due by the first quarter of 1993. To make sure that the working models of the foregoing telecommunications projects conform with industry standards, ASTI's researchers conform with the technical guidelines provided by the Philippine Long Distance and Telephone Company (PLDT).

STUDENT ON-THE-JOB TRAINING

ASTI also led the way with its innovative student training program which employs and trains students in the various advanced R&D projects. With an average of just thirty-eight (38) regular personnel supervising at least sixty (60) students, this makes ASTI a national leader in on-the-job training of students with a ratio of about 1.5 student per regular staff.

For 1992 alone a total of twenty (20) college students availed of the student assistantship grants while a total of forty (40) students benefited from the Presidential Summer Youth Program conducted in ASTI. In fact, according to CSC (Civil Service Commission) records, ASTI had the most PSYP trainees within the DOST and also had the longest training period nationwide (56 days).

ASTI's Student Training Program aims to provide expertise in the use of advanced test instruments and design facilities to the trainees by providing them with first-hand experience in R&D activities. The trainees come from schools like UP, Ateneo de Manila, UST, Mapua, St. Louis University, and Miriam College.

Electrical engineering students avail of advanced instruction and on-the-job training from ASTI research engineers using state of the art equipment and facitities.

LIBRARY SERVICES

Meanwhile a total of one hundred forty three (143) library users trooped to the ASTI library in 1992 to take advantage of its exclusive collections on computer, communications and electronics engineering that are not available in other institutions and university libraries.

The library's acquisitions are mostly technical publications about scientific research, computers, electronics, communications, engineering, programming languages and other specialized areas. They include software manuals and reference books, including various IEEE publications along with regular issues of specialized journals and magazines on information technology and electronics.

Organization

MANDATE

The Advanced Science and Technology Institute (ASTI) was established within the Department of Science and Technology (DOST) under Executive Order 128 on January 30, 1987. As a research and development institute of the Department, it is mandated to contribute to the overall national objectives by:

1. Undertaking long-term researches to strengthen and modernize the science and technology (S&T) infrastructure;
2. Conducting research and development (R&D) work in advanced fields including biotechnology and microelectronics; and
3. Complementing the overall endeavor in the scientific fields with intensive activities in the computer and information technologies.

IMPLEMENTING STRATEGY

Aware of the importance of its role in national development, the Institute, with three fruitful years behind it doing research and development, once more commits itself to take an active role in building the country's future.

ASTI envisions to optimize its positive impact on the country's overall socio-economic development by concentrating on three S&T leading edges which are (1) information technology, (2) electronic instrumentation and control, and (3) the emerging technologies.

To carry out the above-mentioned vision efficiently and effectively, the Institute formulated and will subscribe to the following action agenda:

1. ASTI will undertake advanced R&D projects on the above three leading edges:

- To undertake advanced R&D projects that have high value-added and which will generate employment;
- To implement advanced R&D projects which will have a decisive advantage in terms of (1) *quality*-- comparable to private sector standards; (2) *responsiveness*-- projects done in the least possible time; and (3) *cost*--projects which are cost-effective.

2. ASTI will transfer and/or diffuse developed technologies to the private sector, academe, and rural communities:

- To push for the commercialization and transfer of its various R&D outputs and other related projects;
- To undertake contract researches in advanced S&T for different sectors of society; and
- To foster linkages with interested third parties for their use of ASTI's R&D facilities.

3. ASTI will help develop a responsible S&T human resource pool of professional and competent researchers and scientists in the three identified leading edges: Supporting strategies for this are:

- To establish linkages with national and international scientific learning institutions for scholarship programs and joint researches; and
- To continue to develop a corporate culture which fosters high productivity and a keen sense of social responsibilty and concern for environmental quality.

A mechanical engineer works on some stepper motors for possible use in the robot arm project.

Research and Development Activities

1992 was also a very busy and productive year for ASTI. During the year the Institute embarked an ambitious R&D program geared to provide continuing impact to national development especially in the rural areas. It adopted five (5) R&D thrusts that would keep the country abreast if not even ahead of its ASEAN neighbors in the fields of advanced R&D. These thrusts are the following:

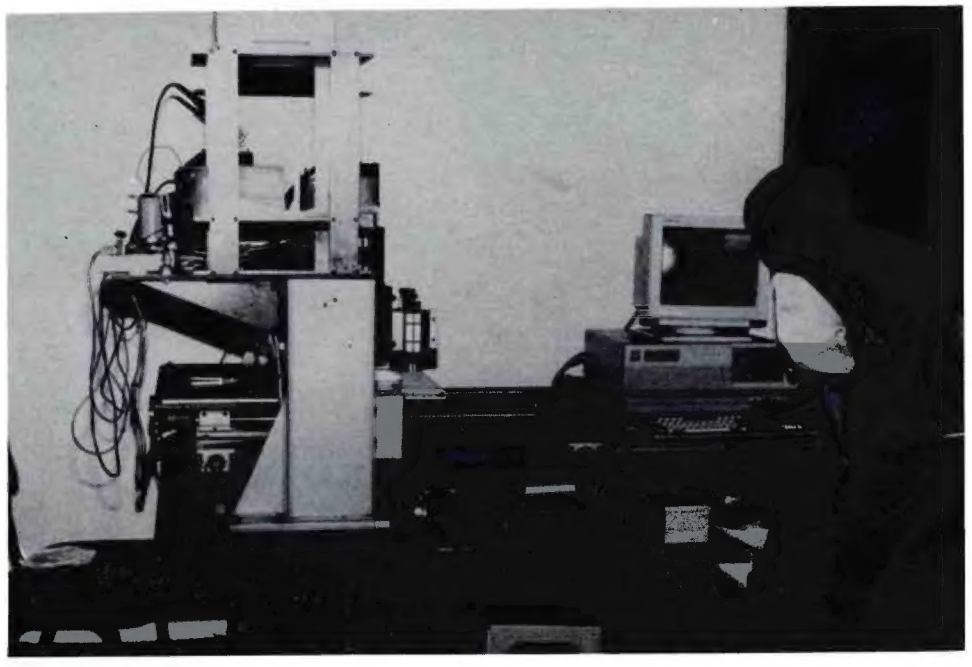
- Computer-Aided Engineering,
- Communications Engineering,
- Industrial Automation,
- Commercial Service Automation, and
- Electronic Device Development.

Below are the R&D projects and activities undertaken under the thrusts just mentioned.

COMPLETED PROJECTS

1. Development of a Numerically-Controlled Drill (NC) Drill for PCB Manufacture (Phase I)

Proponent: ***Robert O. Dizon***



After completing the table-top NC drill prototype, ASTI engineers are now converting a heavy-duty factory drill for mass producing printed circuit boards.

This project aims to spearhead the country's industrialization through automation. Completed under this project are the NC Drill's software and hardware subsystems. For completion in Phase II is its mechanical subsystem which is due in October 1993.

The software subsystem consists of a program that will interface existing (commercially-available) printed circuit board (PCB) design programs with the machine. It also contains the commands and functions specific to the system. The hardware or electrical subsystem includes a microprocessor which controls the movement of the machine and electronic drivers to run the motors.

The efforts expended in this field will pave the way for the establishment of a local technology on NC machines. It will enhance the technical know-how of local engineers in this area and is expected to reduce the cost of NC machines thereby encouraging their use in various industries, particularly in electronics. This will greatly improve the efficiency of local industries and promote their competitiveness. Considerable savings of foreign exchange can also be expected from reduction of the country's dependence on imported automated machine tools.

2. Development of a Prototype Voice and Speech Recognition System

Proponent: ***Peter Antonio B. Banzon***

The voice and speech recognition prototype developed by ASTI is the first locally made system that uses both digital signal processing (DSP) and neural network technologies. It has three components: a baseline preprocessor, a three-layer back prop network and a graphical user interface.

The speech signal is captured via a microphone attached to the audio port of a Sun Sparcstation computer. The recorded speech samples are then passed to the preprocessor which extracts the relevant features to be used for identifying the word spoken and the speaker. Digital signal processing techniques are applied to get a frequency breakdown of the speech sample. A uniform filter bank approach with 32 frequency bands was chosen.

The frequency components of the word sample are then passed to the neural network based classifier. This is a three layer backpropagation network that has been trained to recognize words based on the frequency content. The frequency components are also passed to another three layer backpropagation network which has been trained to recognise voice.

A graphical user interface which uses the X windows library was also developed to integrate all the programs for recording, decoding,

processing, classifying and post-processing. The entire system was implemented as a software simulation using the C language running on a Sun Sparcstation IPC.

Development of local capability in DSP and Neural Networks, two emerging and promising technologies, will provide the country with the needed competitive edge in software development, thus strengthening the local electronics sector. R&D efforts in this project, therefore, will pave the way for quality industrial output, increasing technical expertise and reduction on foreign dependence for advanced technology.

MAJOR ON-GOING PROJECTS

1. Development of a Cellular Phone Base Station

Proponent: *Victorio A. Ochave*

The project aims to address the need for an efficient telecommunications infrastructure in the country, especially in the rural areas. The availability of the system in the rural areas will encourage more business ventures to operate there providing gainful employment for the growing population. The project will add improvements to the PABX (private automatic branch exchange) developed by ASTI in 1991 and develop from it a local switching center to which nearby subscribers will be hooked up using phone cables. On the other hand, distant subscribers will be linked to the local switching center via portable radio phones.

Status:

Completed activities include the design of the antenna subsytem, the simulation and integration of the coded protocol for both subscribers and the base station, the switch, and the designs of the subscriber unit and the base station.

Time Frame: 1st Quarter 1992 - 3rd Quarter 1993

2. Computer-Aided Engineering (CAE) on Application-Specific Integrated Circuit (ASIC) Design

Proponent: ***Louis C. Casambre***

The global trend in the field of microelectronics today is towards higher integration for IC designs. For the country to partake a share in the growing demand for such IC designs, investment in ASIC becomes necessary. ASIC is precisely the technology for higher IC design

integration. Through this technology the Institute not only can upgrade ASTI-generated technologies but can also demonstrate its advantages.

The project complements ASTI's efforts to establish a world-class R&D center for electronics. It aims to set-up an ASIC laboratory with top-of-the-line equipment for IC design as well as training modules for the technical staff in the use of ASIC technology. Plans to open the facility to local electronic companies to assist them in their R&D efforts and train industry personnel in the use of ASIC remains a priority action plan.

Status:

Activities in setting up an ASIC laboratory yielded top-of-the-line equipment for IC design as well as training modules for the technical staff in the use of ASIC technology. They include, among others, analyzer-emulators, time/path mills and construct IC layout-editor. ASIC-based upgrading of product prototypes developed in 1991 is also underway. Scheduled to be designed and fabricated are the ECG Controller Chip and the PABX Time Slot Interchange Circuit.

Time Frame: 1st Quarter 1992 to 3rd Quarter 1993

ASTI engineers and technicians use a variety of CAE software on networked workstations to develop engineering designs from the schematic to the PCB layout.

3. Development of Industrial Process Controllers

Proponent: ***Antonio Ernesto R. Tarroza, Jr.***

In the global squabble for industrial competitiveness, the field of automation and controls have become a challenging arena for S&T excellence. Aware of its significance ASTI took the initiative to promote local capability in the design and manufacture of data acquisition and manufacture of data acquisition and digital control systems for industrial operations.

Efficiency in industrial production will be considerably enhanced with the success of the project. This is because the system will make quality control and monitoring more convenient and expeditious. Being locally designed will consequently reduce its maintenance cost, thus enducing more firms to utilize it. Other gains would be savings of scarce foreign currency and greater independence from foreign technology.

Status:

Since it started, project accomplishments include the following: designed and manufactured the system's remote unit, designed system level and refined its specifications.

Time Frame: 1st Quarter 1992 to 3rd Quarter 1993

4. Development of an Industrial Robot Arm

Proponent: ***Mark B. Rivera***

Aware of the enormous utilization of mechanical automation in advanced economies like Japan and the US, the Institute conducted this project to develop local capability in robotics with the objective of increasing industrial efficiency and competitiveness. The project seeks to build a very basic general-purpose robot arm and the appropriate servo-controller together with the necessary interfaces to the host computer. It shall also include a user-friendly software for the host computer for easy programming and reprogramming of the motion of the robot.

Status:

The project is already through with system designs. The researchers are currently building the prototype robot arm while at the same time planning for the capacity of artificial intelligence to be incorporated in the system.

Time Frame: 4th Quarter 1992 to 3rd Quarter 1993

5. Development of a Real-Time Data Acquisition System for Monitoring Seismic/Volcanic Activities

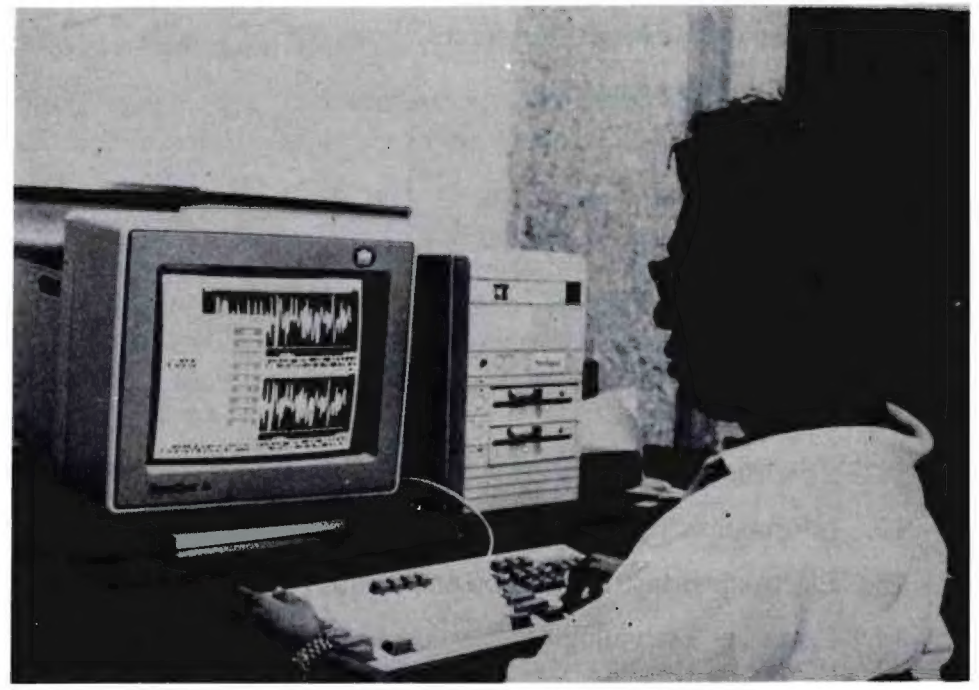
Proponent: ***Louis C. Casambre***

In response to the constant and unpredictable threat of volcanic and seismic activities to Philippine socio-economic life, the Institute was driven to undertake the project to develop self-sufficiency in designing instruments for environmental monitoring. The Seismic Data Acquisition System (SDAS) being developed is digital, portable and self-contained. It functions by recording data on triggered events (quakes) initially as analog inputs which are converted into digital form to be stored in its memory. The operating software developed facilitates the storage, processing and analysis of data on an IBM PC.

Status:

The project is in the process of debugging the already working prototype even as the software is also being improved and refined. Final testing and packaging will be jointly conducted with the Philippine Institute of Volcanology and Seismology (PHIVOLCS), the project's immediate user.

Time Frame: Project Completion at the 2nd Quarter of 1993



A computer science student assistant finalizes the software interface for the Seismic Data Acquisition System before integration with the hardware components.

Inter-Agency Participation

DOST SCIENCE AND TECHNOLOGY MASTER PLAN (STMP)

The focal point of efforts to be a newly industrializing country at the end of the century is the leading edges identified in the high-priority areas of the National Science and Technology Master Plan.

Leading Edges

Leading edges refer to sectors that provide products and services that are expected to services that are expected to yield substantial contributions to GDP. These contributions are assessed in terms of:

- Product's and service's potential for increased productivity;
- Increase in value-added; and
- Expanding the range of locally produced goods and services.

The fifteen (15) leading edges are the following:

1. Agriculture
2. Aquaculture and Marine Fisheries
3. Forestry and Natural Resources
4. Metals and Engineering
5. Textile Industry
6. Mining and Minerals
7. Process Industry
8. Food and Feed Industry
9. Energy
10. Transportation
11. Construction Industry
12. Information Technology
13. Electronics, Instrumentation and Control
14. Emerging Technologies
15. Pharmaceuticals

(STMP, 10 July 1990, p. 32.)

NATIONAL TECHNOLOGY AGENDA

The Philippine version of a "planned" free economy is what NTA all to achieve--one attended by global competitive industry as well as an empowered people. It is the same ideal society that the Medium Term Development Plan (MTPDP) of the Ramos' Administration aims to achieve. More precisely, the PHILIPPINES 2000 showcases the following salient features: export level of US$23B, per capita GNP of at least US$1000, and a poverty incidence of 30% or below.

The NTA as a derivative of the Science and Technology Master Plan affirms the general strategies contained therein in the pursuit of the foregoing objectives:

- Modernize production
- Upgrade R&D capability
- Develop manpower and infrastructure for science and technology

The highlights of the NTA will be the relative resource allocations of both private and public sectors according to the major components which are the following:

The Export Winners

They include a list of products and services that were identified by consultations with industry, government, and academe.

The Basic Domestic Needs

This is a list of products and services deemed necessary to sustain a productive population and provide infrastructure especially in the rural areas.

The Support Industries

These industries serve the needs of both the export and the domestic market and are crucial to the development of both.

The Coconut Industry

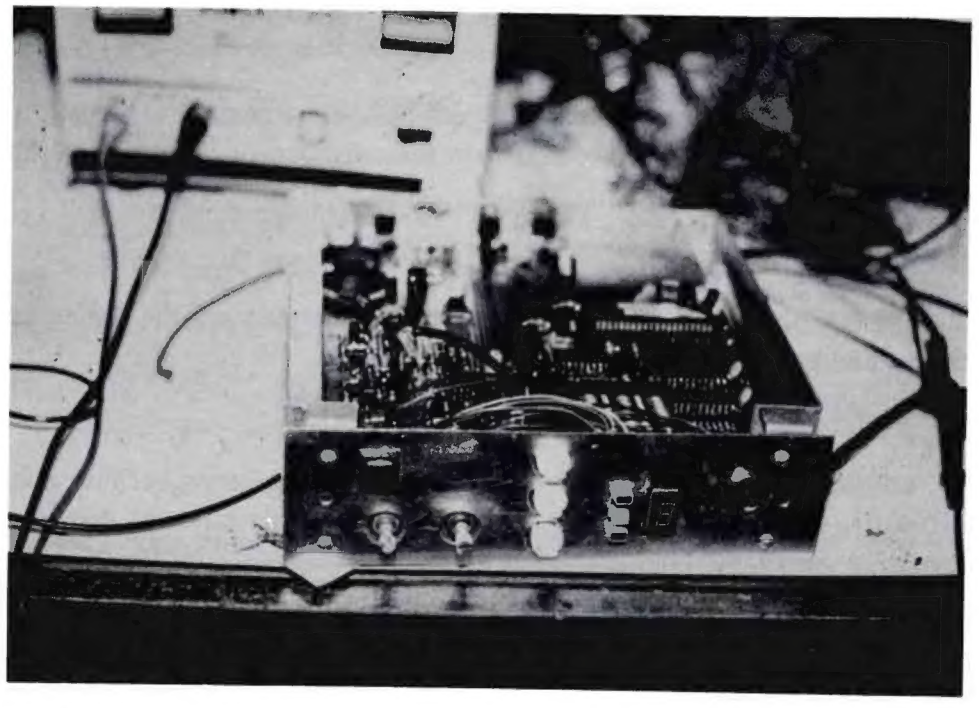
Special attention will be given for the coconut industry because one third of the population depends on it directly or indirectly and a major portion of our arable land is planted to coconut.

ASTI'S PARTICIPATION

Given the framework NTA has provided the Institute in the succeeding years shall intensively undertake R&D projects in the field of instrumentation and controls. The primary purpose of which is to strengthen products identified as export winners such computer software, marine products, the fruit industry, etc.

Coming into the second NTA component, i.e., basic domestic needs ASTI's competence squarely comes in handy because developing the local telecommunications industry has always been its business since its operation. Having been mandated by law to conduct advanced R&D in this field ASTI acknowledges the corresponding responsibilities of strengthening the local telecommunications infrastructure. With the special attention that NTA places in developing the rural areas, the ASTI projects to be undertaken shall be rural based.

Aside from taking an active role in the NTA and pursuing the goals of the STMP, ASTI will also pursue other priority areas that are within its mandate. Its R&D undertakings shall not only involved advanced technologies like Digital Signal Processing and Neural Networks but also the emerging technologies like computer-aided engineering of ICs. The purpose of which is to promote both a comparable technical base to that of our ASEAN neighbors and a forward-looking policy for local balanced S&T.



An ASTI-developed HF radio unit undergoing testing and analysis after being assembled and packaged.

Institutional Linkages

ASTI believes that fostering healthy linkages with both government and private institutions in the pursuit of its objectives will not only maximize its impact to national development but will also promote goodwill to local R&D undertakings. It is along this vein that the Institute vigorously pursued meaningful and productive relationships with different S&T organizations in the past year. The objective ranges from joint-project undertaking to facilities build-up to manpower development. Among these significant linkages are the following:

GOVERNMENT

ASTI's tie-up with the Philippine Council for Advanced Science and Technology, Research and Development (PCASTRD). This saw a number of R&D projects jointly undertaken by both organizations, many of them are ongoing: "Development of Industrial Process Controllers, Industrial Robot Arm, and the Prototype Bar Code Reader System".

Another meaningful linkage of ASTI with government is with the Technology Application and Promotion Institute. The TAPI-ASTI tie was born in the light of the numerous ASTI-generated technologies that need immediate market studies for their eventual transfer to industry. The first was a full-blown feasibility study on the ASTI Diagnostic and Monitoring Electrocardiograph Hospital Equipment followed by ongoing prefeasibility studies on the PABX, Packet Radio TNC and Inverter.

INDUSTRY

The Australian-ASEAN Economic Cooperation Program (AAECP), an international linkage of the Institute, has been instrumental to both manpower development and facilities build-up for ASTI. The past year saw a number of ASTI personnel attending seminars and trainings held under the auspices of AAECP. The Institute has also been chosen the implementing agency in establishing the AAECP Microelectronics Design Center to be housed by ASTI. The Center will be opened to researchers from the private sector who may avail its various high-end R&D equipment.

The Institute has also existing formal agreements with two formidable private entities involved in electronics and IT R&D, to wit, the Automated Microelectronics, Inc. (AMI) and the Electronics Industry Association of the Philippines, Inc. (EIAPI). The agreements provide for joint researches, technical training in R&D know-how and use of laboratory facilities. The linkage aids in fostering a closer working relationship with the private sector.

ACADEME

ASTI also maintains a very close relationship with the academe which is recognized as the hallmark of advanced researches. While ASTI's academic linkages have been mostly with the University of the Philippines where it is presently located, the Institute also has meaningful ties with other educational institutions that have resulted in the valuable exchange of knowledge and sevices.

The formidable team composed of ASTI, the UP Computer Science Department, Registrar's Office and the UP Foundation that successfully built the Automated Scoring System (using Neural Networks Technology) for the University of the Philippines College Admission Test (UPCAT) in 1991 again jointly undertook its immediate implementation in 1992. ASTI and the UP Computer Science Department provided the technical aspect of its implementation while the UP Registrar's Office provided the implementing staff. It is expected that with the implementation of the project last year, unnecessary delay of the UPCAT result will be avoided in the future.

Administration

As of December 31, 1992, there was a total of thirty five (35) ASTI employees composed of 24 technical and 14 administrative staff. The implementation of the attrition law prevented replacements of either resigned or transferred personnel which resulted in frequent lack of available manpower for the various R&D activities.

This has so far been the most pressing problem to confront ASTI. Undue delays in project schedules often occur when the required personnel cannot be hired or reassigned during critical periods of the project cycle. Sometimes, existing bureaucratic procedures have hampered the Institute's efficiency and effectivity in delivering its mandate. To address this problems, measures like requesting the CSC for exemption from the the said law and the recruitment of contractual staff were adopted. ASTI also submitted a proposal to the DBM to reorganize the structure of the Institute.

During the year, one Senior SRS was designated ASTI Officer-in-Charge in view of the resignation of the Director. The former took charge of the Institute for the period until a new Director is officially appointed. Meanwhile, two other Senior SRS were designated Officers-in-Charge for the Information Technology Division and the Bio-Engineering Division in view of the resignations of their respective Division Chiefs. The OICs are to perform the functions of the latter pending their replacements.

Future Directions

The Ramos Administration ushers a new promise for S&T to take an active role for the Philippines to achieve an NIC status by the year 2000. That promise is fulfilled when the National Technology Agenda (NTA) was conceived to provide the blueprint to consummate a critical mass for industrialization. ASTI supports the NTA and the visions it embodies. For the next succeeding years, ASTI will be working for the success of the Program.

Table 1. Financial Report of Operations for Personnel, Maintenance and Operating Expenses and Capital Outlay

	Budgetary Allotment	Obligations Incurred	Unobligated Allotment
Personnel Services	P3,346,400.00	P3,318,386.07	P28,013.93
Maintenance and Operating Expenses	4,500,645.00	4,306,427.21	194,217.79
Capital Outlay	4,788,000.00	4,456,986.00	330,014.00
TOTAL	**P12,635,045.00**	**P12,082,799.10**	**P552,245.90**

Chart 1. 1992 PS, MOE and CO Financial Operations

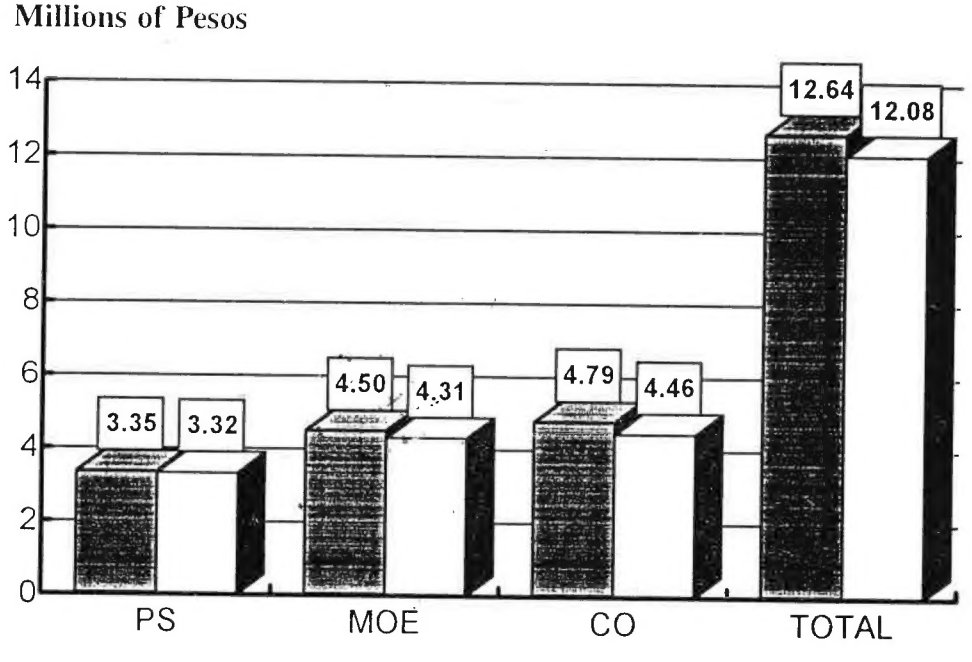
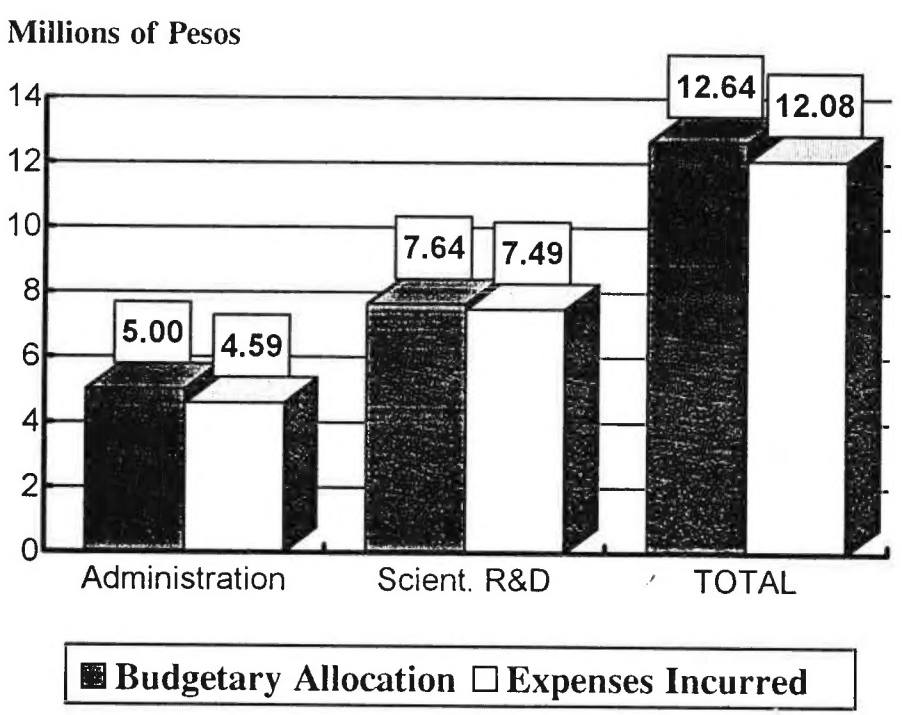


Table 2. Financial Report of Operations for Administrative Services and Scientific Research and Development

	Budgetary Allotment	Obligations Incurred	Unobligated Allotment
General Administration and Support Services	P5,002,045.00	P4,590,597.24	P411,447.76
Scientific Research and Development	7,633,000.00	7,492,201.86	140,798.14
TOTAL	**P12,635,045.00**	**P12,082,799.10**	**P552,245.90**

Chart 2. 1992 Financial Operations for Administrative Services and Scientific R&D



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